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(54) Title of the invention: Network terminal controller and network system

(57) Abstract:
Purpose: To eliminate the need to provide a power switch and facilitate the designing by charging an electric signal which flows through the transmission line of a network and supplying a source voltage to respective parts when the charging voltage reaches or exceeds a specific voltage.
Constitution: Low-order terminal devices 1a-1c receive a network signal 4 through a network interface part 5, an insulating circuit 6, and a diode 7 and this received network signal 4 is charged in a charging part 8. Through this charging operation, the charging voltage Vc of the charging part 8 rises. When the charging voltage Vc reaches or exceeds the ON voltage V1 of a power relay 11, the power relay 11 turns ON to input a commercial AC voltage to a power source part 9,

which turns ON. Consequently, the low-order terminal devices 1a-1c are powered ON and become operation states. When communication is made between a high-order controller 3 and low-order terminal devices 1a-1c, the charging is carried on.

## [Claims]

[Claim 1] A network terminal controller arranged in network terminal equipment, including a charging part which charges an electrical signal which flows through a network transmission line, a power source part which supplies power supply voltage to each part in network terminal equipment, a powering-on means which makes the mentioned above power source part an operating state when charge voltages of the mentioned above charging part reach more than prescribed voltage.

[Claim 2] A network terminal controller arranged in network terminal equipment, including a charging part which charges an electrical signal which flows through a network transmission line, a detection means by which charge voltages of this charging part detect traffic volume of a transmission line.

[Claim 3] A network system which includes network terminal equipment connected by transmission line, and its high-order device characterized by including a charging part which charges an electrical signal with which the mentioned above network terminal equipment flows through a network transmission line,

a power source part which supplies power supply voltage to each part in network terminal equipment, the 1st means by which it has a network terminal controller which includes a powering-on means which makes the mentioned above power source part an operating state when charge voltages of the mentioned above charging part reach more than prescribed voltage, and the mentioned above high-order device carries out predetermined time sending out of the electrical signal of a given period by power supply starting processing to network terminal equipment in a transmission line, the 2nd means to send out an electrical signal of a given period to a transmission line with a time interval of less than a discharge time constant of the mentioned above charging part, and the 3rd means to stop sending out of an electrical signal by the mentioned above 2nd means according to a power source cutoff demand to network terminal equipment.

**[Detailed description of the invention]**

[0001] [Industrial application] This invention relates to a network terminal controller and a network system.

[0002] [Description of the prior art] If it is in network systems, such as LAN which has a high-order controller, the data transmission and reception between the terminal units of the low rank which passed transmission and reception of the data between a high-order controller and low-ranking arbitrary terminal units or a high-order controller on the assumption that

the power supply of a low-ranking terminal unit was turned on is possible.

[0003] Conventionally, the power supply in a low-ranking terminal unit has composition with most common using an operating state by carrying out ON operation of the electric power switch formed in the front-operations board of the device by a help.

[0004] On the other hand, the control line for exclusive use is constructed between a high-order controller and each terminal unit, and it also has the composition which adopted the remote control method that turns on and off the power supply of each terminal unit with this control line.

[0005] [Problems to be solved by the invention] However, since it was necessary to allocate an electric power switch in the distribution power board exposed to device front in composition of operating the electric power switch of each terminal unit by a help, there was a problem of becoming an obstacle when designing the structure of the locating position of a power supply or a device in a terminal unit.

[0006] Since the control line for exclusive use was needed if it is in the composition that turns on and off the power supply of each terminal unit by remote control with the control line for exclusive use, there was a problem that the whole network system became expensive.

[0007] The mechanical design of a terminal unit is easy for the purpose of this invention, and it is providing the network terminal controller and network system which can turn on and off the power supply of a terminal unit from a high-order controller without constructing the control line for exclusive use.
[0008] [Means for solving the problem] To achieve the above objects, a terminal control unit of this invention, when an electrical signal which flows through a network transmission line is charged and the charge voltages reach more than prescribed voltage, it is characterized by having a powering-on means which makes an operating state a power source part which supplies power supply voltage to each part in network terminal equipment.
[0009] [Function] According to the mentioned above means, the terminal control unit arranged in a low-ranking terminal unit will make a power source part an operating state (ON state), if a terminal control unit is connected to a network, the electrical signal (information signal) which flows through a network transmission line will be charged and the charge voltages will reach more than prescribed voltage. This operating state is continued until the electrical signal which flows into a transmission line stops beyond over predetermined time (time to become settled in the discharge time constant of a charging part).

[0010] On the other hand, if the electrical signal which flows into a transmission line stops beyond in predetermined time, a power source part will be controlled to a non operating state (OFF state).
[0011] Here, although the electrical signal which flows through a transmission line is an information signal, at the time of starting of the whole system, predetermined time sending out of the electrical signal of a given period is carried out by the power supply starting processing of a high-order controller in a transmission line. By this, the power supplies of the terminal unit of the whole system connected to the transmission line can be made into an ON state all at once.
[0012] After being in an ON state, it charges continuously with the information signal sent and received between a high-order controller and arbitrary terminal units, and a charging part maintains the ON state of a power source part.
[0013] As a result, it becomes unnecessary to form an electric power switch in a terminal unit, and a mechanical design becomes easy. The power supply of a terminal unit can be turned on and off from a high-order controller, without constructing the control line for exclusive use.
[0014] Since it is not necessary to always establish the power supply for surveillance of an ON state in order to supervise the control signal for a power ON/OFF, the safety of a terminal unit improves.

[0015] [Example] Next, a drawing explains one example of this invention.
[0016] Drawing 1 is a line-block diagram showing one example of the terminal unit which formed the network terminal controller of this invention.
[0017] In drawing 1, a plurality of low-order terminal units 1a, 1b, 1c are connected to the high-order controller 3 by the network transmission way 2.
[0018] A plurality of low-order terminal units 1a, 1b, and 1c as shown on detail on behalf of the low-order terminal unit 1a, the charging part 8 which charges the pulse form network signal 4 which flows through the network transmission way 2 via the network interface part 5 and the insulating circuit 6, and the diode 7, when the charge voltages of the power source part 9 which supplies power supply voltage to each part in the low-order terminal unit 1a, and the charging part 8 reached more than prescribed voltage, it was in the ON state, and the commercial alternating current voltage (AC100V) from the power source voltage input part 10 was inputted into the power source part 9 and it has the power relay 11 that makes the power source part 9 an ON state.
[0019] Here, the charging part 8 is constituted by the capacitor and the discharge part 12 which includes a resistance element is connected to the both ends. And the insulating circuit 6, the diode 7, the charging part 8, the power relay 11, the discharge part 12, and the

comparators 13-15 constitute the terminal control unit which controls ON and OFF of a power supply.
[0020] The output of the charging part 8 is inputted into the comparators 13, 14, 15 to which reference voltage Vr1, Vr2, Vr3 were set different, respectively. These comparators 13, 14, 15 are for the charge voltages of the charging part 8 detecting the traffic volume of the network transmission way 2. The output signal of the comparison result is supplied to the communication control part 16 which controls the whole low-order terminal unit 1a.
[0021] The communication control part 16 sends and receives data through the network interface control part 17, when sending and receiving a data signal between low-order terminal units.
[0022] On the other hand, the high-order controller 3 the network signal 4 of a given period on the network transmission way 2 by the power supply starting processing to the low-order terminal units 1a, 1b, 1c, predetermined time sending, furthermore, the network signal 4 of a given period is sent out to the network transmission way 2 with the time interval of less than the discharge time constant of the charging part 8, and it is constituted so that sending out of the network signal 4 may be stopped according to the power source cutoff demand to the low-order terminal units 1a, 1b, 1c.

[0023] Next, the power ON/OFF operation of the low-order terminal units 1a-1c in this composition are explained.
[0024] Drawing 2 is a flow chart which shows the procedure of power supply starting processing over the low-order terminal unit of the high-order controller 3.
[0025] Other processings are performed, if the high-order controller 3 faces the power source part 9 of the low-order terminal units 1a-1c using an ON state, it judges whether the powering-on demand was inputted by an operator or internal processing (Step 20) and the powering-on demand is not inputted (Step 21).
[0026] However, if a powering-on demand is inputted, predetermined time sending out of the electrical signal (network signal 4) of a given period will be carried out on the network transmission way 2 (Step 22).
[0027] Next, if it judges whether the power source cutoff demand was inputted (Step 23) and the power source cutoff demand is not inputted, next, it judges whether predetermined time t progress of the network signal transmission time twist of Step 22 was done (Step 24), and if it has passed, it will return to Step 22 and predetermined time sending out of the electrical signal (network signal 4) of a given period will be carried out again on the network transmission way 2. Here, the predetermined time t is the time of less than the discharge time constant of the charging part 8.

[0028] However, if predetermined time t progress of is not done, it returns to Step 23 and it is judged whether the power source cutoff demand was inputted.
[0029] When the power source cutoff demand is inputted by this judgment, processing is ended without progressing to Step 24.
[0030] According to this processing, by the input of a powering-on requirement signal, the network signal 4 of a given period is sent out to the network transmission way 2 between predetermined time, and is intermittently sent out at intervals of the predetermined time t after that, and sending out of the network signal 4 is stopped by the input of a power source cutoff demand.
[0031] On the other hand, although the low-order terminal units 1a-1c receive the mentioned above network signal 12 by the network interface part 5 and the insulating circuit 6, and the diode 7, this received network signal 12 is charged by the charging part 8.
[0032] It goes up, as this charging effect shows the charge voltages Vc of the charging part 8 to drawing 3. And when the charge voltages Vc are set to Vc>=V1 to ON voltage V1 of the power relay 11, the power relay 11 serves as one, commercial alternating current voltage is inputted into the power source part 9, and the power source part 9 is turned on. As a result, it will be in the state where the power supply of the low-order

terminal unit was switched on, and the low-order terminal units 1a-1c will be in operational status.

[0033] Next, when communication is performed between either the high-order controller 3 or low-order terminal units 1a-1c, charge is continued by the network signal 4 with which the charging part 8 of each low-order terminal unit flows through the network transmission way 2.

[0034] In this case, although a part of charging energy is discharged by the discharge part 12, whether the resistance part R of the discharge part 4 and the constant of the part C are decided to always be set to Vc>=V1, even when the exchange is performed with the greatest time interval in communication between the high-order controller 3. Before being set to Vc<=V1, the power relay 11 maintains an ON state by sending out the dummy network signal 4 by processing of Steps 24 and 22 of drawing 2. For this reason, the low-order terminal units 1a-1c serve as operational status.

[0035] However, when communication between the high-order devices 3 is completed, the network signal 4 is no longer sent out, a power source cutoff demand is moreover inputted in the high-order controller 3 and sending out of the dummy network signal 4 is also stopped, the charge voltages Vc of the charging part 8 are discharged according to a discharge time constant with the discharge part 12.

And when it comes to Vc<V1, a power relay turns off and the power source part 9 is turned off.

[0036] The low-order terminal units 1a-1c are interlocked with the input of the powering-on demand and power source cutoff demand in the high-order device 3, and ON and OFF control of the power supply is carried out by such control.

[0037] Thus, it becomes unnecessary to form an electric power switch in each of the low-order terminal units 1a-1c, and a mechanical design becomes easy. The power supply of the low-order terminal units 1a-1c can be turned on and off from the high-order controller 3, without constructing the control line for exclusive use.

[0038] Since it is not necessary to always establish the power supply for surveillance of an ON state in order to supervise the control signal for a power ON/OFF, the safety of the low-order terminal units 1a-1c improves.

[0039] If the insulating circuit 6, the diode 7, the charging part 8, the power relay 11, and the discharge part 12 are made as one unit, it is possible to use it, including also in the existing low-order terminal unit.

[0040] On the other hand, the comparators 13, 14, 15 compare the charge voltages Vc of the charging part 8 with reference voltage Vr1, Vr2, Vr3 and supply the signal of the comparison result to the communication control part 16.

[0041] As shown on the voltage waveform drawing of drawing 3, reference voltage Vr1, Vr2, and Vr3, it is set as the relation of Vr1<Vr2<Vr3, and at the time of Vc>Vr1, when the outputs of the comparator 13 are one (logic 1) and Vc>Vr2 and the outputs of the comparators 13 and 14 are one (logic 1) and Vc>Vr3, the output of the comparators 13, 14, and 15 serves as one (logic 1).

[0042] The communication control part 16 judges the traffic volume of the network transmission way 2 with the signal of these triplets. That is, in proportion to the traffic volume of the network transmission way 2, as for the charge voltages Vc, a pressure value becomes high.

[0043] The communication control part 16 uses this and detects the traffic volume of the network transmission way 2 with the comparison result signal outputted from the comparators 13, 14, 15.

[0044] When it is necessary to retransmit a message by a communication error etc., the detection result of this traffic volume is used, for example in order to choose and broadcast a time zone with little traffic volume again.

[0045] In the power supply starting processing of drawing 2, although the power supply of the low-order terminal units 1a, 1b, 1c is turned on and off according to the input of a powering-on demand and a power source cutoff demand, by performing power supply

starting processing ignited by powering on of the high-order controller 3, and stopping execution of power supply starting processing ignited by the power supply cutoff of the high-order controller 3, the power ON/OFF of the high-order controller 3 can be interlocked with, and the power supply of the low-order terminal units 1a, 1b, 1c can be turned on and off.

[0046] It replaces with a comparator, and the charge voltages Vc of the charging part 8 are changed into a digital signal, and it may be made to input into the communication control part 16 by A/D converter 18, as shown on drawing 4.

[0047] Drawing 5 is a block diagram showing other examples of the terminal control unit of this invention. Drawing 1 and identical parts are expressed with identical codes.

[0048] If the charge voltages Vc of the charging part 8 reach prescribed voltage, this example, if the relay 19 for charge is made one, the direct current voltage of the rectification circuit 27 is charged at the 2nd charging part 25 and the charge-voltages Vc2 reaches the prescribed voltage V1, it will be made to make the power source part 9 by making the power relay 11 one into an ON state. In drawing 5, comparators for detecting traffic volume are omitting the graphic display.

[0049] If it is in this composition, the charge and discharge damping time constant of the 2nd charging part 25 is set up more greatly than the charge and discharge damping time constant of the charging part 8. And it is trying to charge the direct current voltage of the rectification circuit 27 directly at the 2nd charging part 25.

[0050] For this reason, although the ON timing of the power relay 11 is a little overdue compared with the case of the example of drawing 1, as shown on the wave form chart of drawing 6, only the length t1 of the discharge time constant of the 2nd charging part 25 is in OFF timing. Thus, a standup can carry out ON and OFF control of the power supply of the low-order terminal units 1a-1c in the characteristic that falling is late, early.

[0051] Since the long time interval which sends out a dummy network signal can be taken in the high-order controller 3 when falling becomes late, other processings and control are performed in the meantime, and it becomes possible to improve communication performance.

[0052] In each the mentioned above example, although the power relay 11 shall turn on and off commercial alternating current voltage, when direct current voltage is supplied to the power source voltage input part 10, this direct current voltage will be turned on and off.

When direct current voltage is supplied to the power source voltage input part 10, the rectification circuit 27 of drawing 5 becomes unnecessary.

[0053] [Effect of the invention] When the electrical signal that flows through a network transmission line was charged in this invention as explained above, and the charge voltages reached more than prescribed voltage, it was made to make the power source part which supplies power supply voltage to each part in network terminal equipment into the operating state. Thus, it becomes unnecessary to form an electric power switch in a terminal unit, and a mechanical design becomes easy. The power supply of a terminal unit can be turned on and off from a high-order controller, without constructing the control line for exclusive use.

[0054] Since it is not necessary to always establish the power supply for surveillance of an ON state in order to supervise the control signal for a power ON/OFF, it is effective in the safety of a terminal unit improving.

[0055] By detecting the traffic volume of a network transmission way with the charge voltages of a charging part, a time zone with little traffic volume is chosen, and it is effective in the ability to perform retransmission of message etc. efficiently.

[0056] By sending out a dummy electrical signal, before the charge voltages of a charging part turn into less than prescribed voltage from a high-order

controller, it can be stabilized and the power turn state of a terminal unit can be maintained, even when there is little traffic of a transmission line.

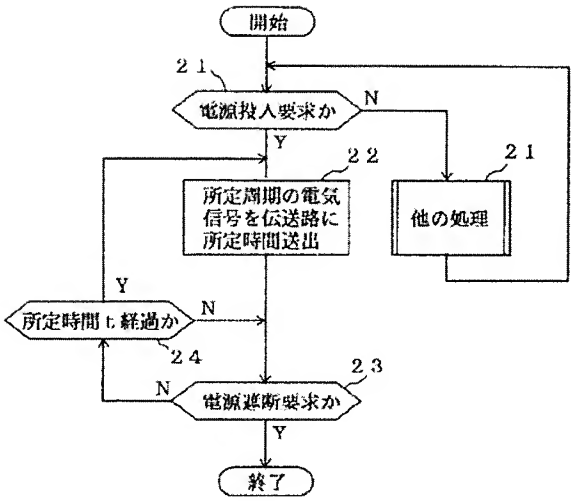
## [Brief description of the drawings]

[Drawing 1] is a line-block diagram showing one example of this invention.
[Drawing 2] is a flow chart which shows the power supply starting processing of a high-order controller.
[Drawing 3] is a wave form chart showing the charge-voltages waveform of a charging part.
[Drawing 4] is a line-block diagram showing other examples for detecting traffic volume.
[Drawing 5] is a block diagram showing other examples of this invention.
[Drawing 6] is a time chart which shows the ON/OFF timing of the charge voltages of a charging part, and a power relay in drawing 5.

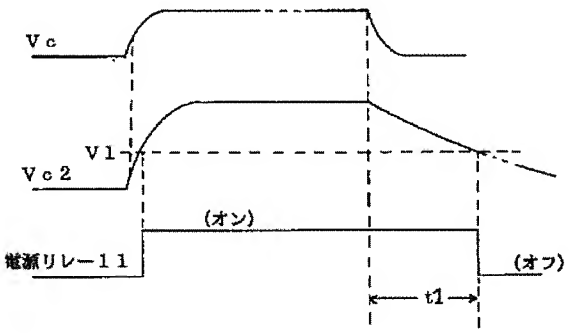
## [Description of numerals]

1a, 1b, 1c... A low-order terminal unit,
2... A network transmission way,
3... A high-order controller,
4... A network signal, 5... A network interface part,
6... An insulating circuit, 8... A charging part,
9... A power source part,
10... A power source voltage input part,
11... A power relay, 12... A discharge part,
13 14, 15... A comparator,
17... A network interface control part

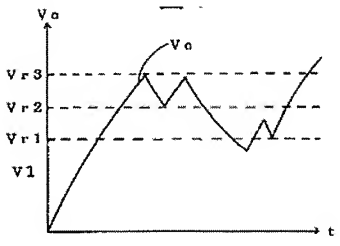
# Drawing 2



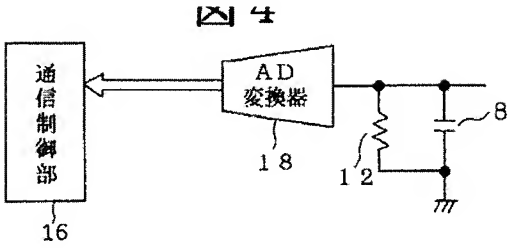

# Drawing 6



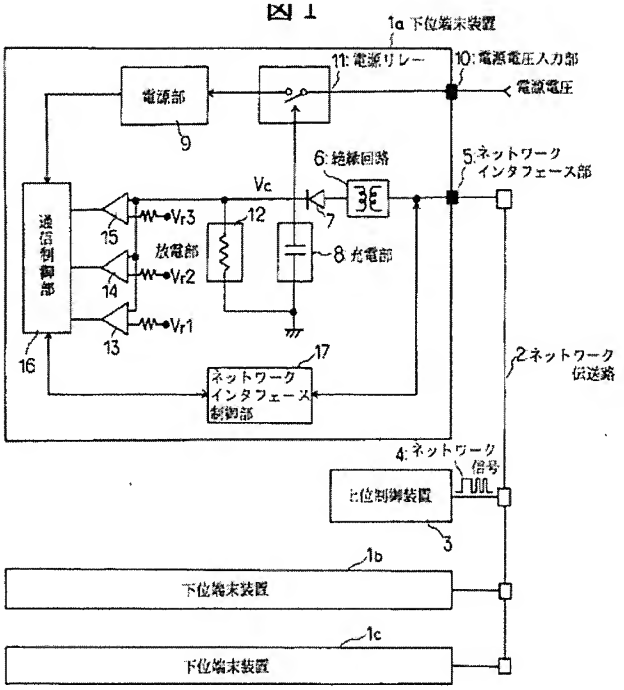

Drawing 3




Drawing 4



Drawing 1




Drawing 5